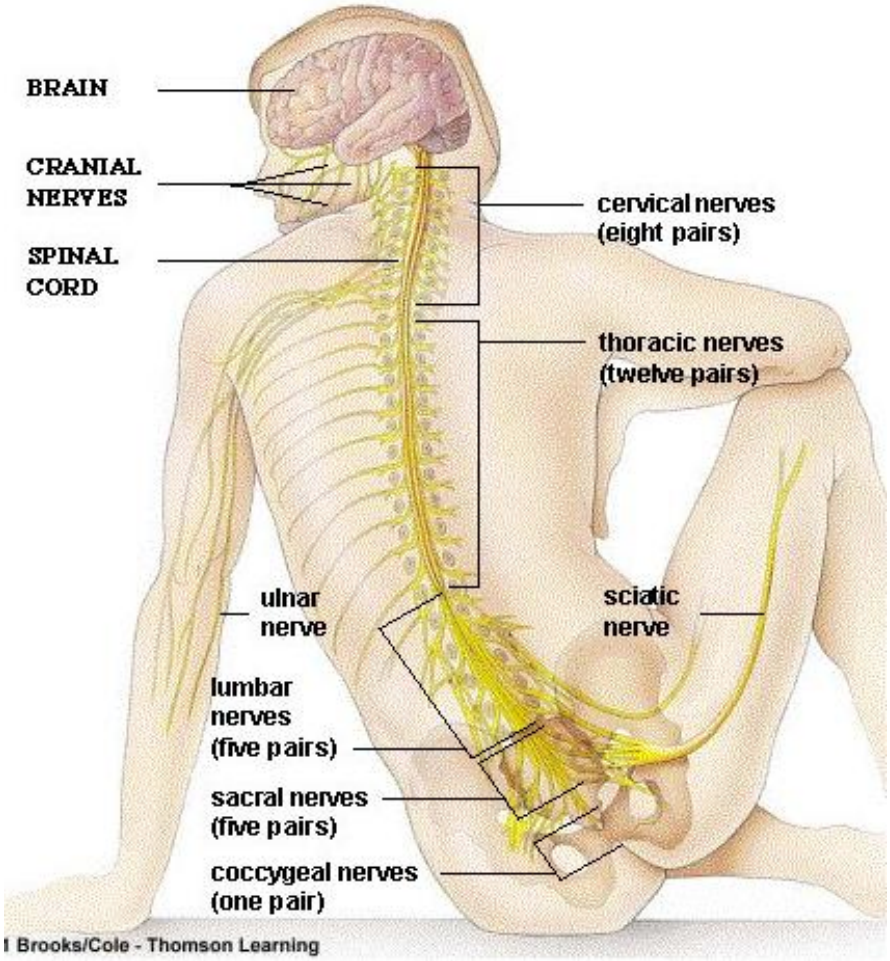
Ch 14: Peripheral Nervous System

Sensory Receptors

Motor Endings

Cranial Nerves

The Four Plexuses
Extremities



Developed by
John Gallagher, MS, DVM

LAS POSITAS COLLEGE

Review of Reflexes

Fast, preprogrammed, inborn, automatic responses

Occur in the CNS at the spinal cord or brainstem levels

May be either monosynaptic or polysynaptic

All require

- **a. stimulus at receptor**
- **b. sensory information relay**
- **c. processing at CNS level**
- **d. activation of motor response**
- **e. response of peripheral effector**

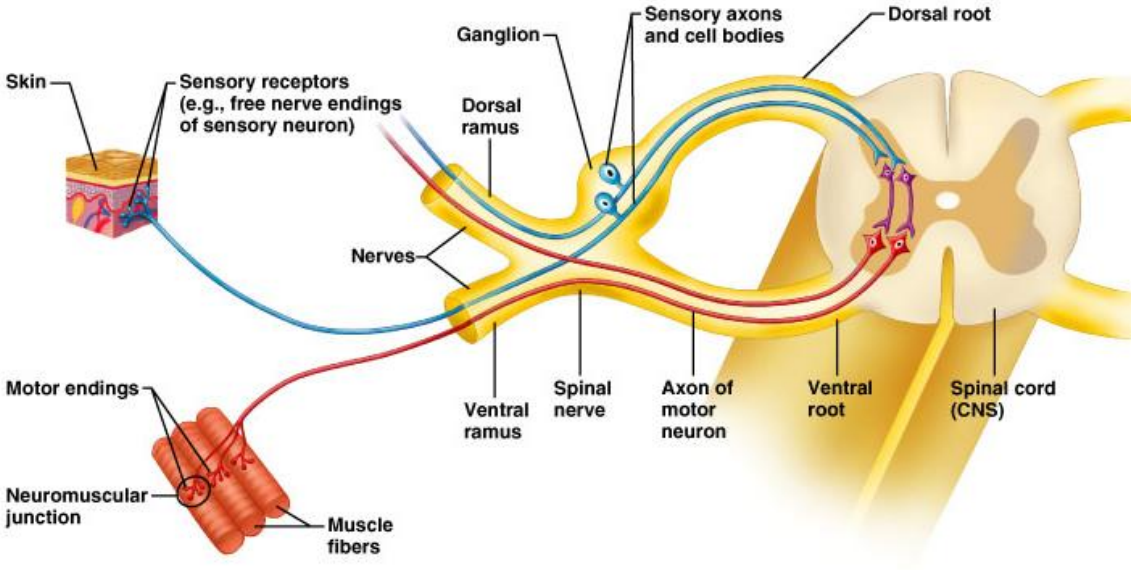
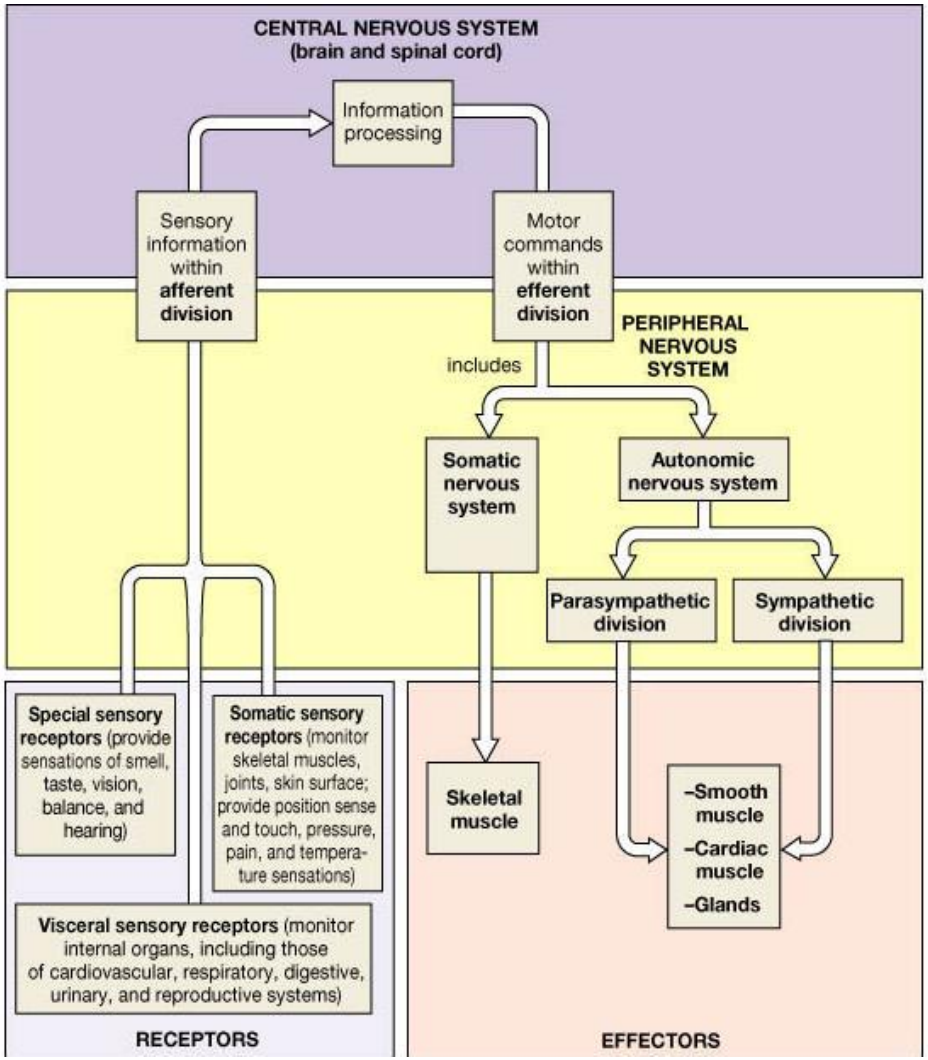


Fig 14.2

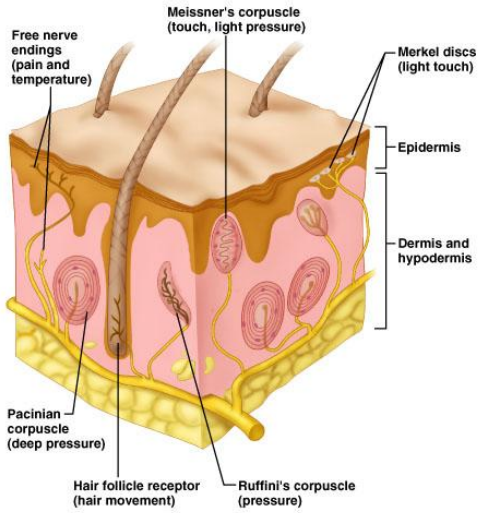
Peripheral Sensory Receptors

- Classified by
  - Location
    - Exteroceptors
    - Interoceptors
    - Proprioceptors
  - Stimulus
    - Thermoreceptors, etc.
  - Structure
    - Pacincian corpuscle
  - Adaptive abilities


CENTRAL NERVOUS SYSTEM
(brain and spinal cord)
Information processing
Sensory information within afferent division
Motor commands within efferent division
PERIPHERAL NERVOUS SYSTEM
includes
Somatic nervous system
Autonomic nervous system
Parasympathetic division
Sympathetic division
Special sensory receptors (provide sensations of smell, taste, vision, balance, and hearing)
Somatic sensory receptors (monitor skeletal muscles, joints, skin surface; provide position sense and touch, pressure, pain, and temperature sensations)
Visceral sensory receptors (monitor internal organs, including those of cardiovascular, respiratory, digestive, urinary, and reproductive systems)
Skeletal muscle
-Smooth muscle
-Cardiac muscle
-Glands
RECEPTORS
EFFECTORS

Peripheral Sensory Receptors, cont'd

- Free Nerve Endings
  - Prominent in epithelia
  - Pain and Temperature
  - Light touch (Merkel's discs)



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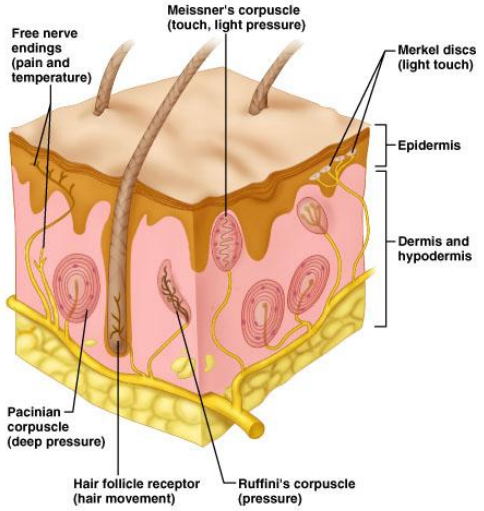
Peripheral Sensory Receptors, cont'd

- Encapsulated Nerve Endings
  - Meissner's Corpuscles (Light Touch)
  - Pacinian (lamellated) Corpuscles
    - Throughout the Body
    - Adaptive
    - Mechanical Pressure
  - Ruffini's Corpuscles
    - Pressure and Touch
    - Not very Adaptive



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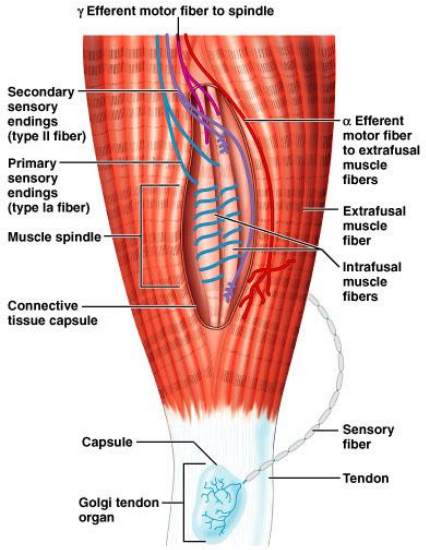
Proprioception

- Stretch Monitors detect position in space
  - Modified muscle fibers (cells)
- Golgi Tendon Organ
  - Monitors tendon tension
  - “Knee Jerk Reflex” is monosynaptic
- Joint Kinesthetic Receptors
  - Joint Capsules
  - All of the above types of receptors



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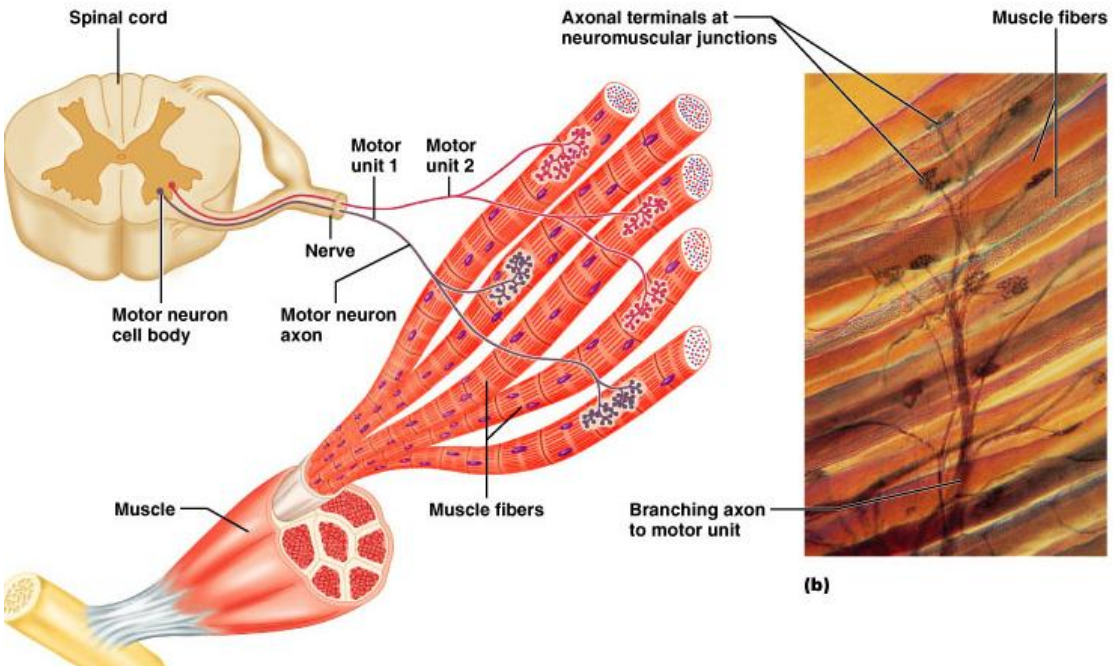
The Other End (Effectors)

- Motor End Plate: Similar to Synapse
  - Skeletal Muscle
  - ACh
    - Broken down quickly, compared to nerve synapse
  - Remember definition of Motor Unit
- Visceral (smooth) Muscle and Glands
  - Varicosities



Peripheral Nerves (repetitio est…)

Function:
sensory - afferent
motor - efferent
mixed - contains axons of both

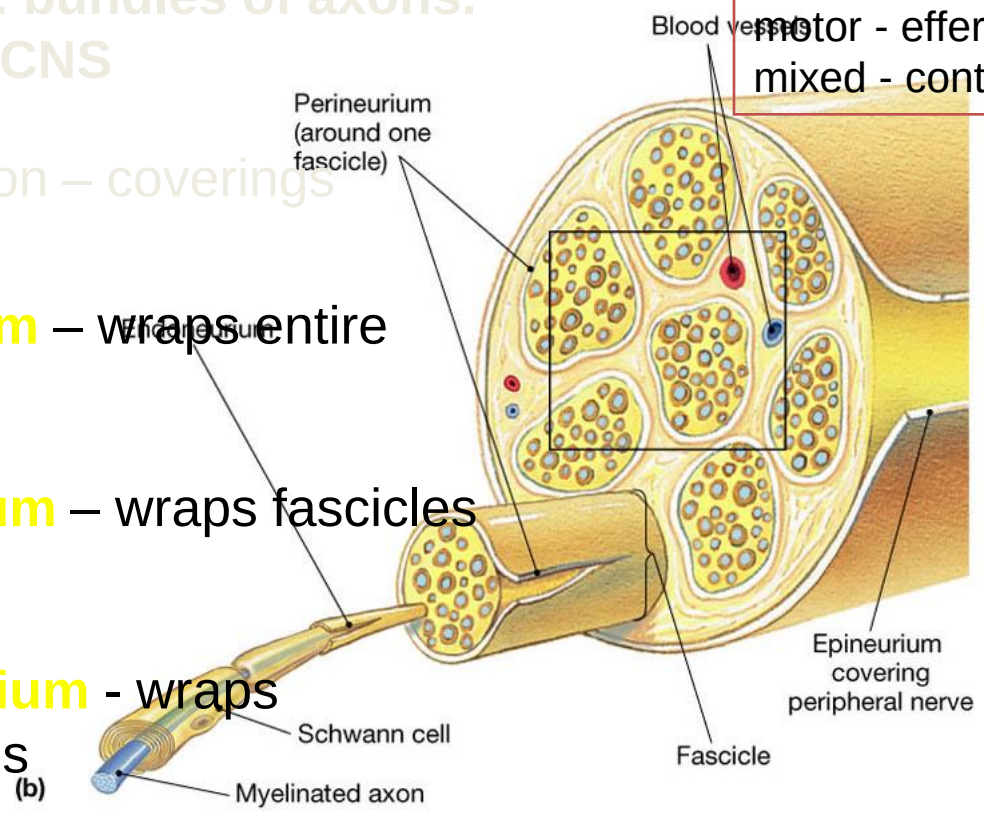
Definition: bundles of axons. AKA tracts in CNS

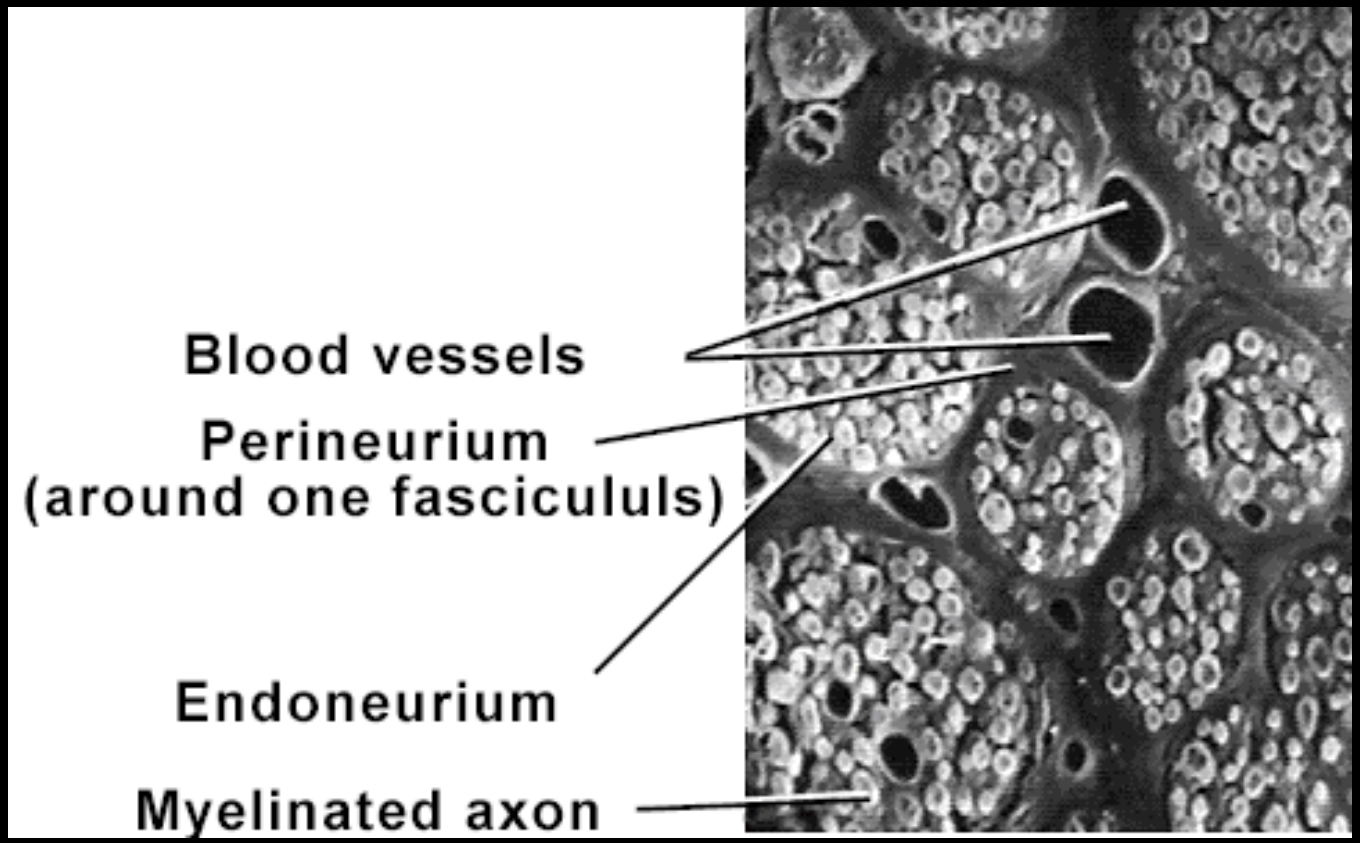
Organization – coverings (chapter 12):

Epineurium – wraps entire nerve

Perineurium – wraps fascicles of tracts

Endoneurium - wraps individual axons




Blood vessels
Perineurium
(around one fascicululs)
Endoneurium
Myelinated axon

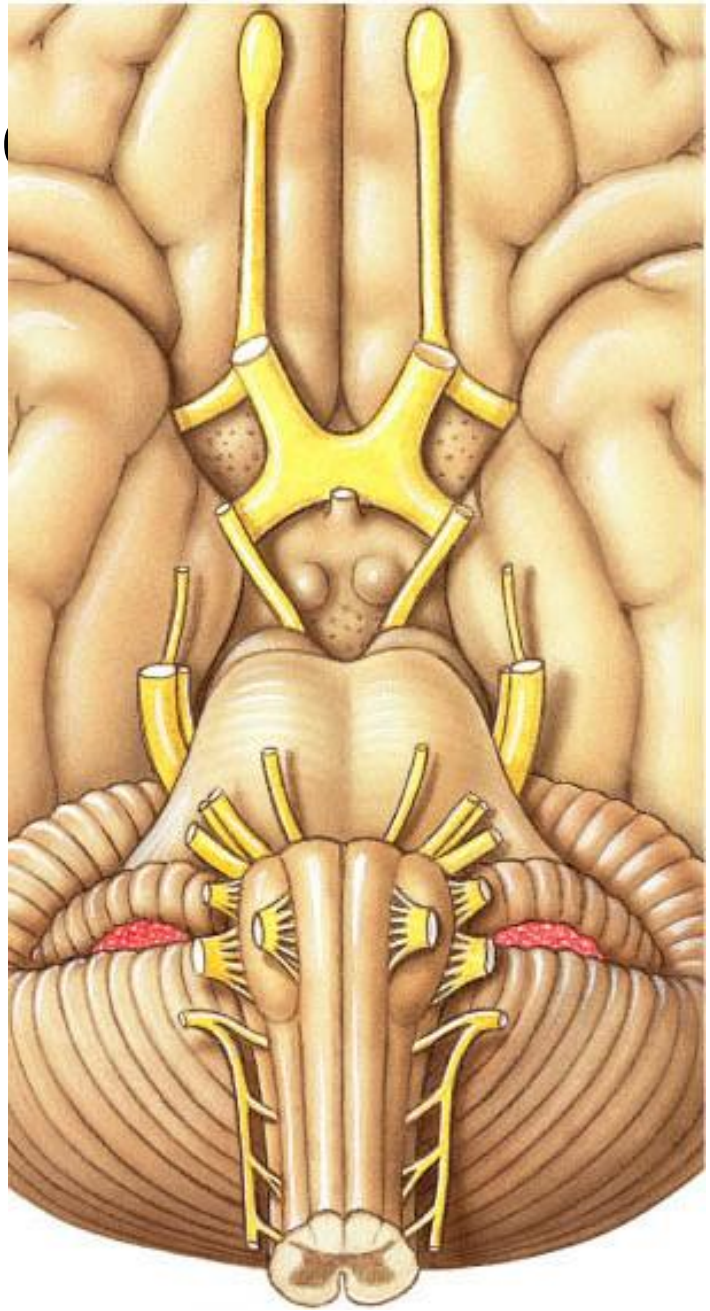
Cranial Nerv

- **Twelve pairs:**
  - **2 attach to forebrain (Tel- & Diencephalon)**
  - **10 attach to brainstem**

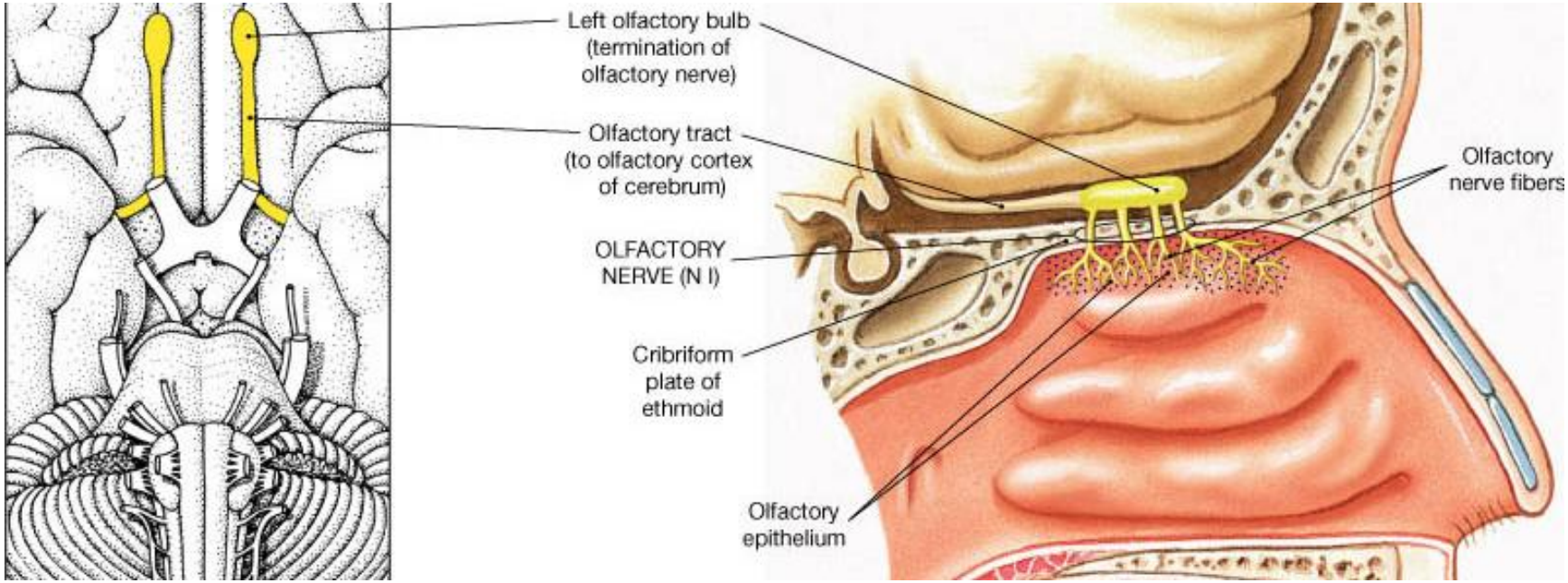
    (Mes-, Met- and Myelencephalon)

- **Names relate to appearance or function**

  Classification
  Origin
  Destination



Olfactory Nerve (= CN or N I)


Left olfactory bulb (termination of olfactory nerve)
Olfactory tract (to olfactory cortex of cerebrum)
OLFACTORY NERVE (N I)
Cribriform plate of ethmoid
Olfactory epithelium
Olfactory nerve fibers

C: Sensory

O: Olfactory Epithelium in nasal cavity

D: Olfactory bulbs (by way of cribriform plate of ethmoid)

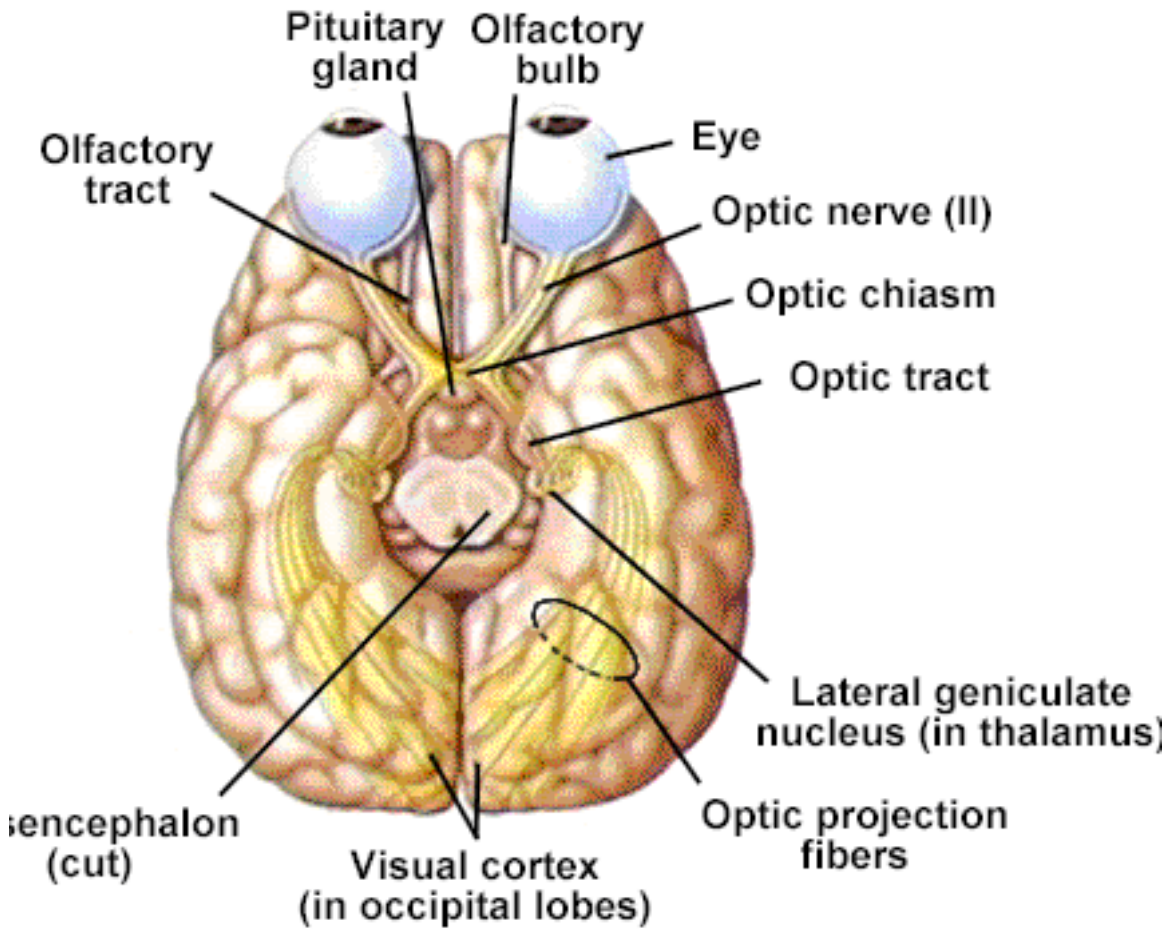
Only CN directly attached to Cerebrum

Optic Nerve (N II)

C: Sensory

O: Retina

D: by way of optic foramen of sphenoid to Diencephalon (optic chiasma) and to occipital lobe



Oculomotor (N III)

C: Motor

O: Mesencephalon

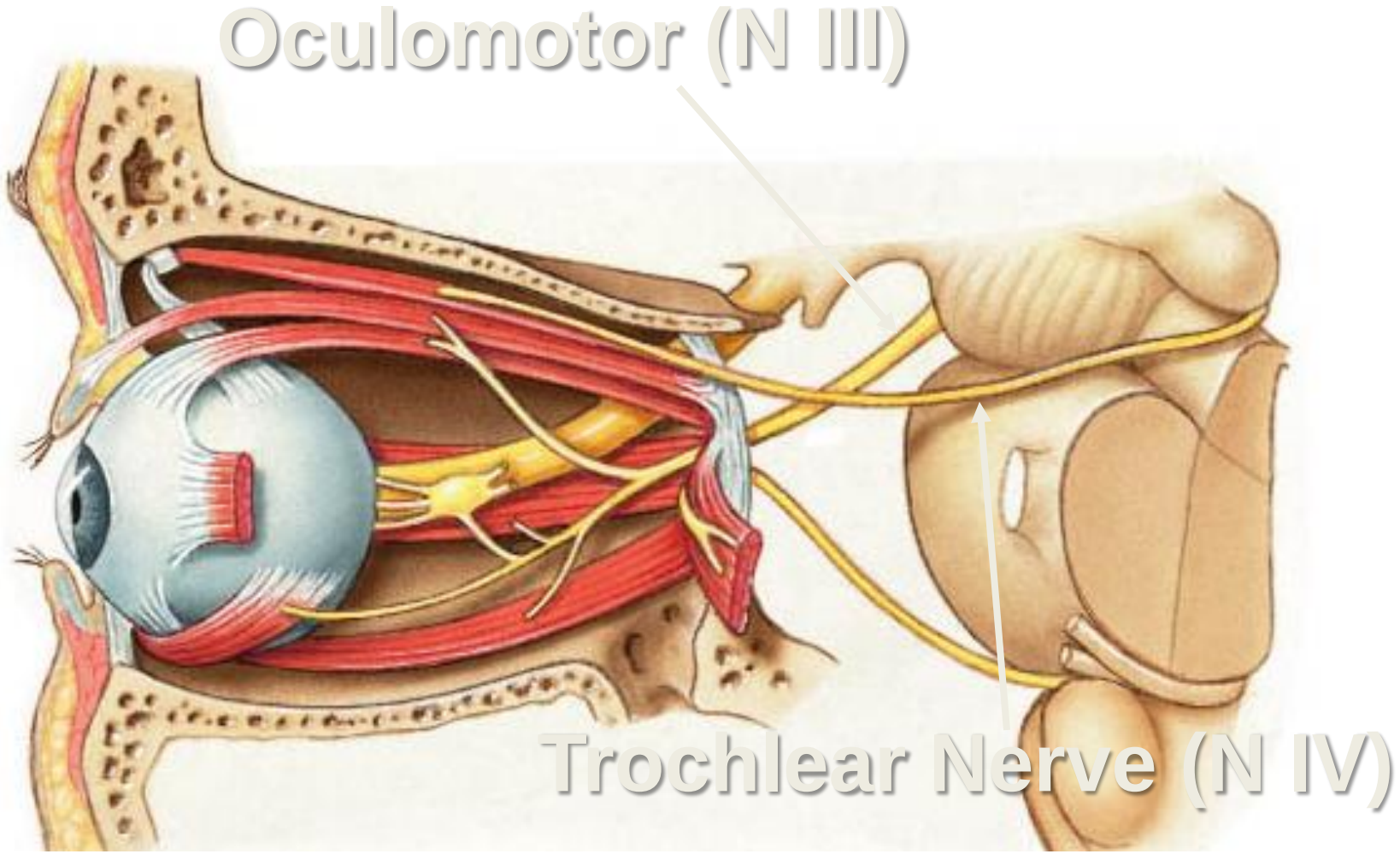
D: Somatic motor to superior, inferior, medial recti and inferior oblique; visceral motor to intrinsic eye muscles by way of superior orbital fissure

Trochlear (N IV)

C: Motor

O: Mesencephalon

D: superior oblique muscle by way of superior orbital fissure



Lateral view

Trigeminal (CN V)

C: Mixed

three major branches

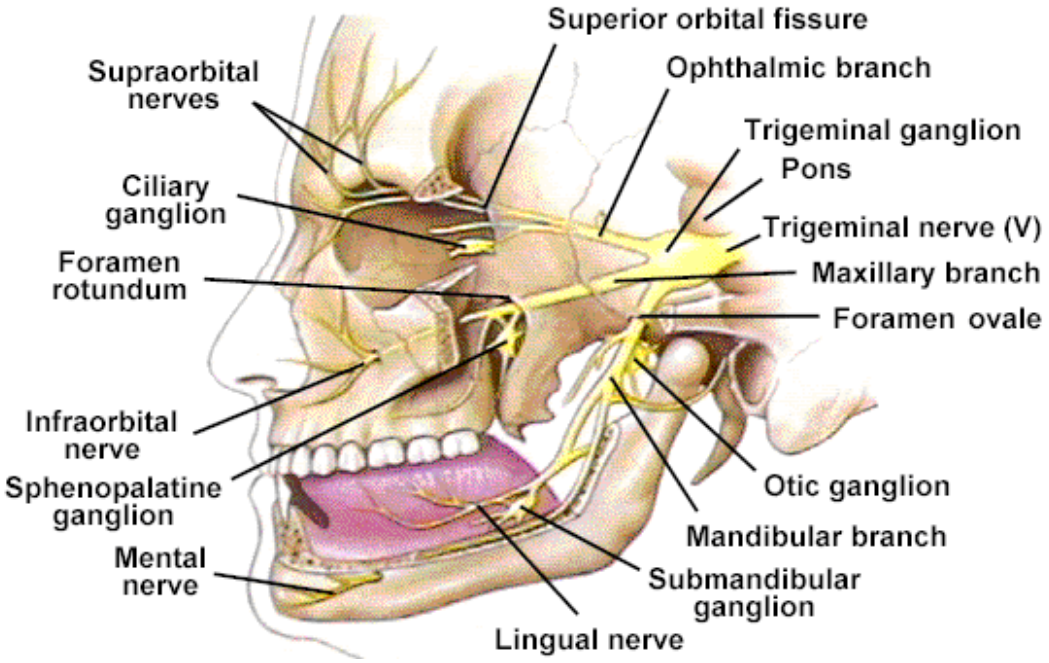
1. Ophthalmic (sensory)

2. Maxillary (sensory

3. Mandibular (mixed

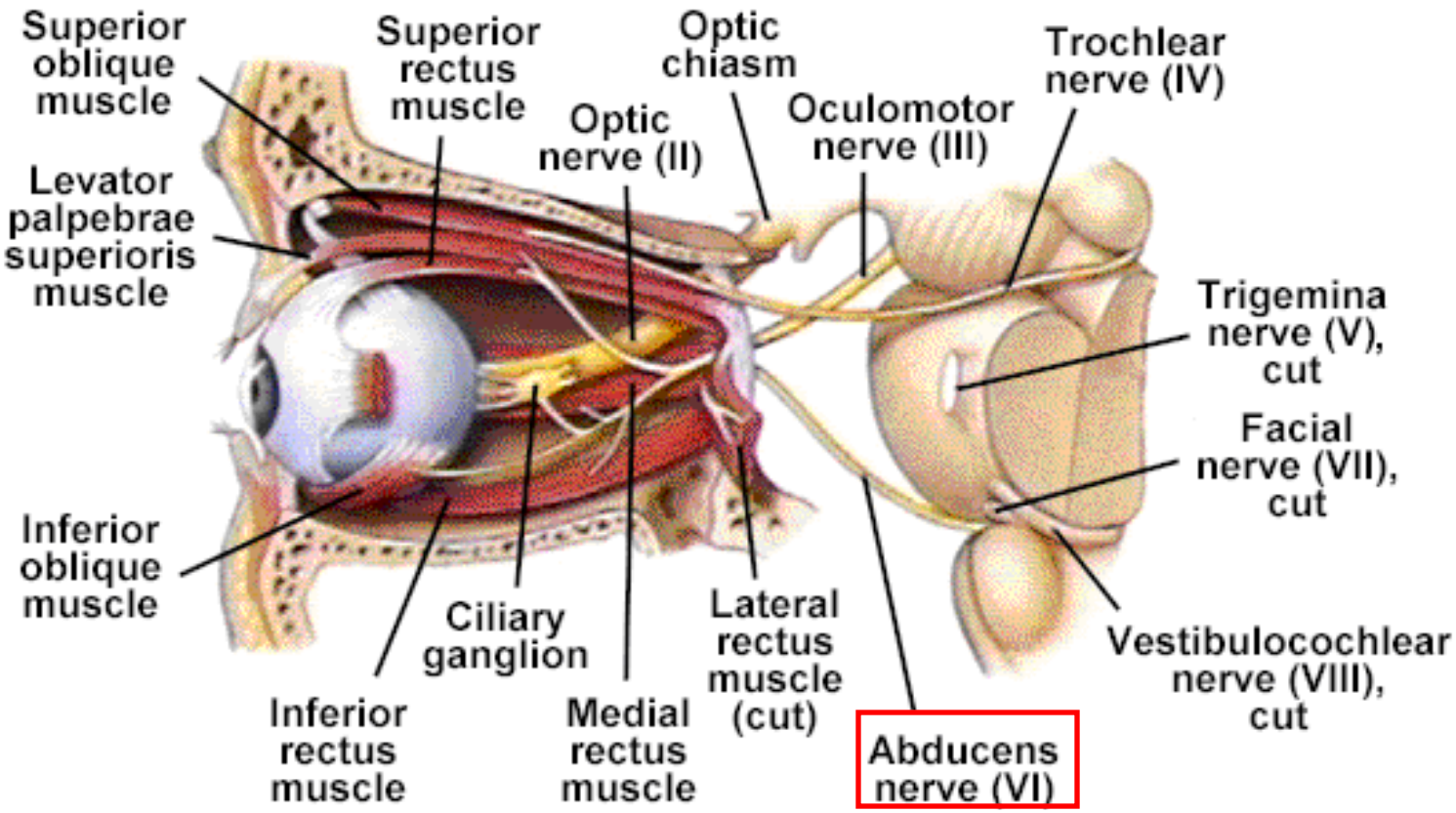
O: face / nuclei of pons

D: sensory nuclei in pons / mu
of mastication



Abducens (CN VI)

C: Motor
O: Pons
D: Lateral rectus eye muscle



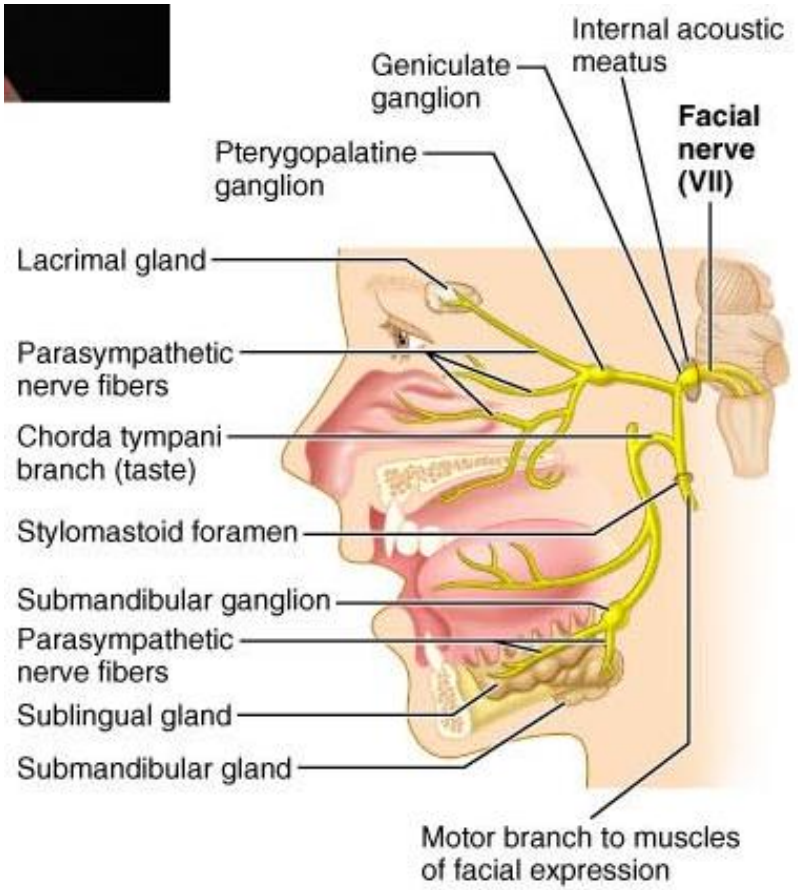
Facial (CN VII)

C: Mixed

O: sensory from taste receptors of anterior 2/3 of tongue / motor from pons

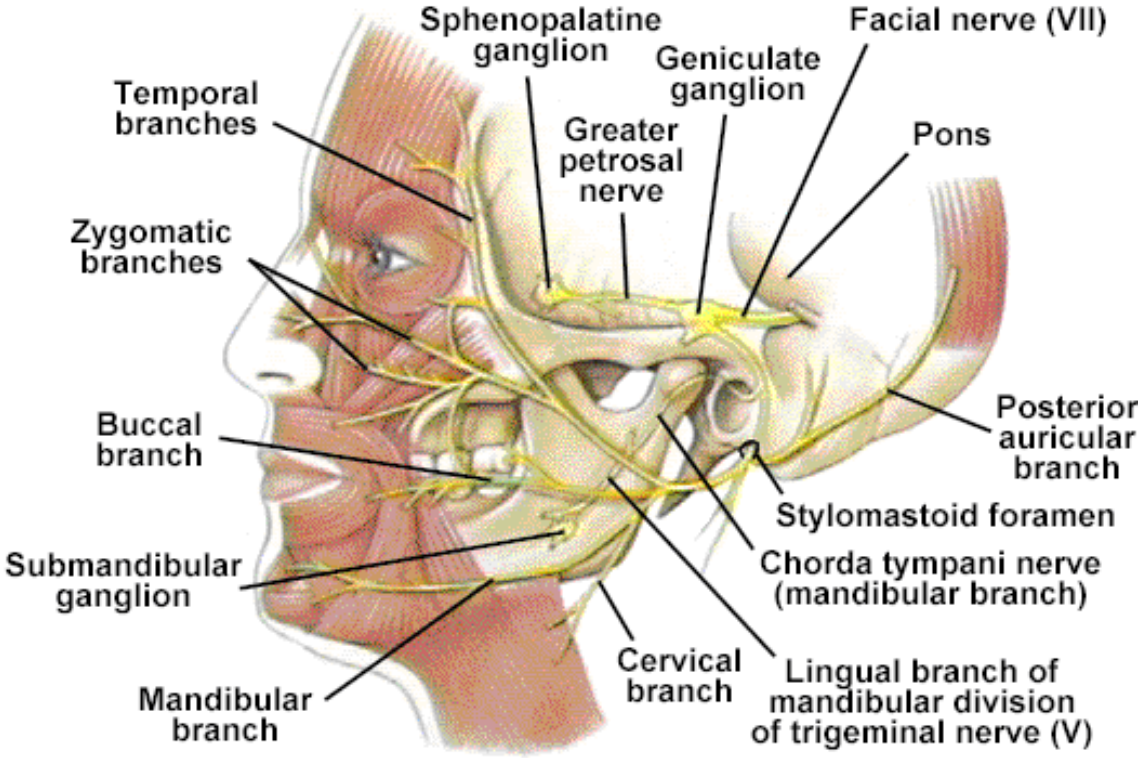
D: Sensory to sensory nuclei of pons / motor muscles of facial expression, visceral motor to tear gland.

Table 14.3



(c) Parasympathetic efferents and sensory afferents

Facial (CN VII), cont'd



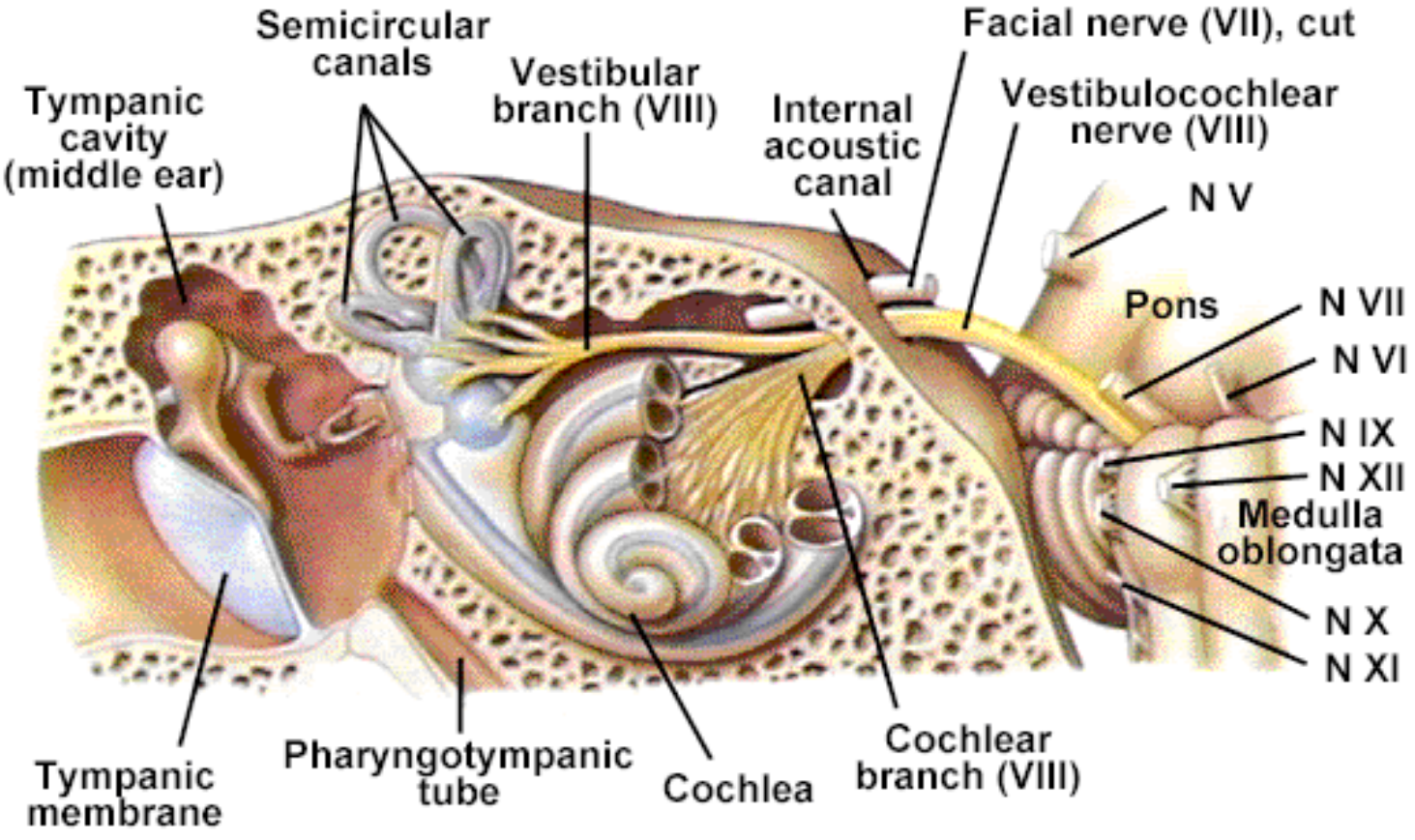
Bell's Palsy

Vestibulocochlear (CN VIII)

- C: Sensory
- O: Receptors of inner Ear
- D: Nuclei in Pons and medulla oblongata

- AKA acoustic nerve

Vestibulocochlear (CN VIII)

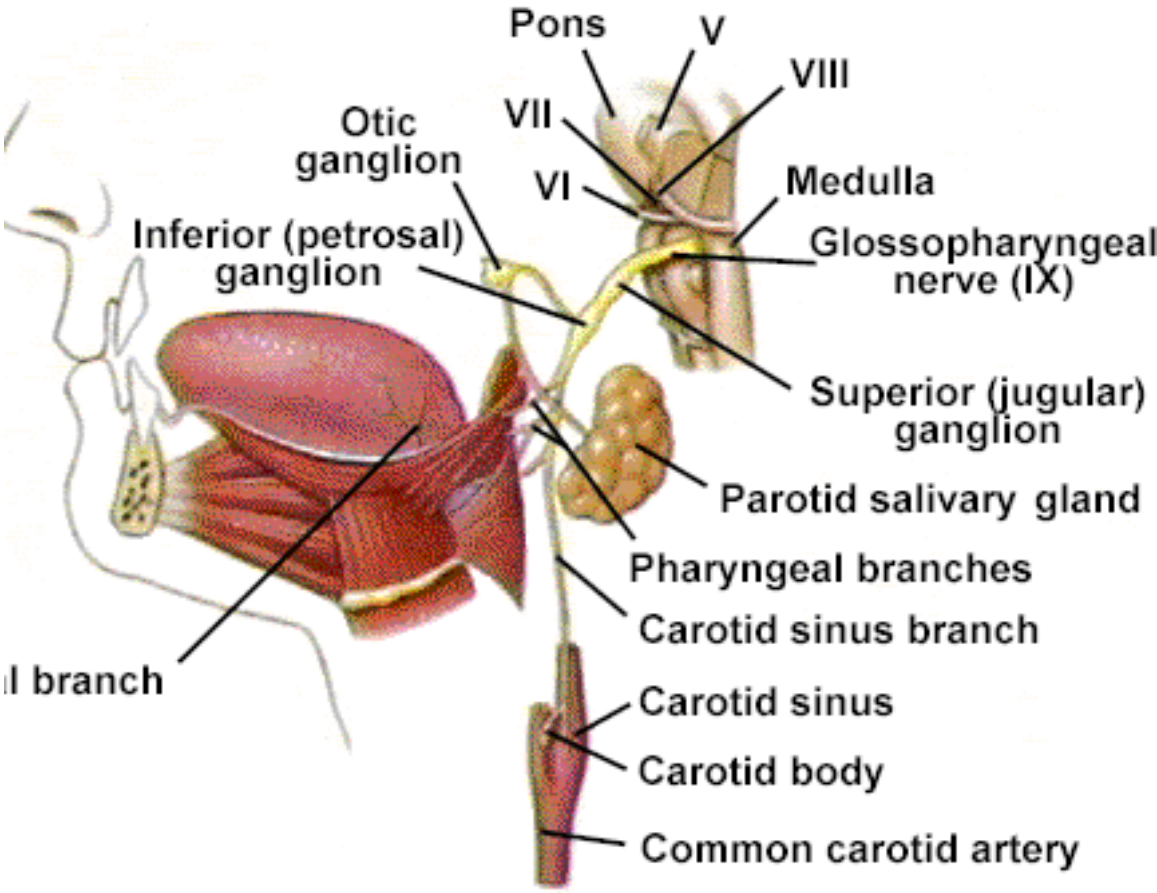


Glossopharyngeal (CN IX)

C: mixed

O: sensory from posterior 1/3 of tongue / motor from medulla oblongata

D: medulla / muscles for swallowing, parotid gland



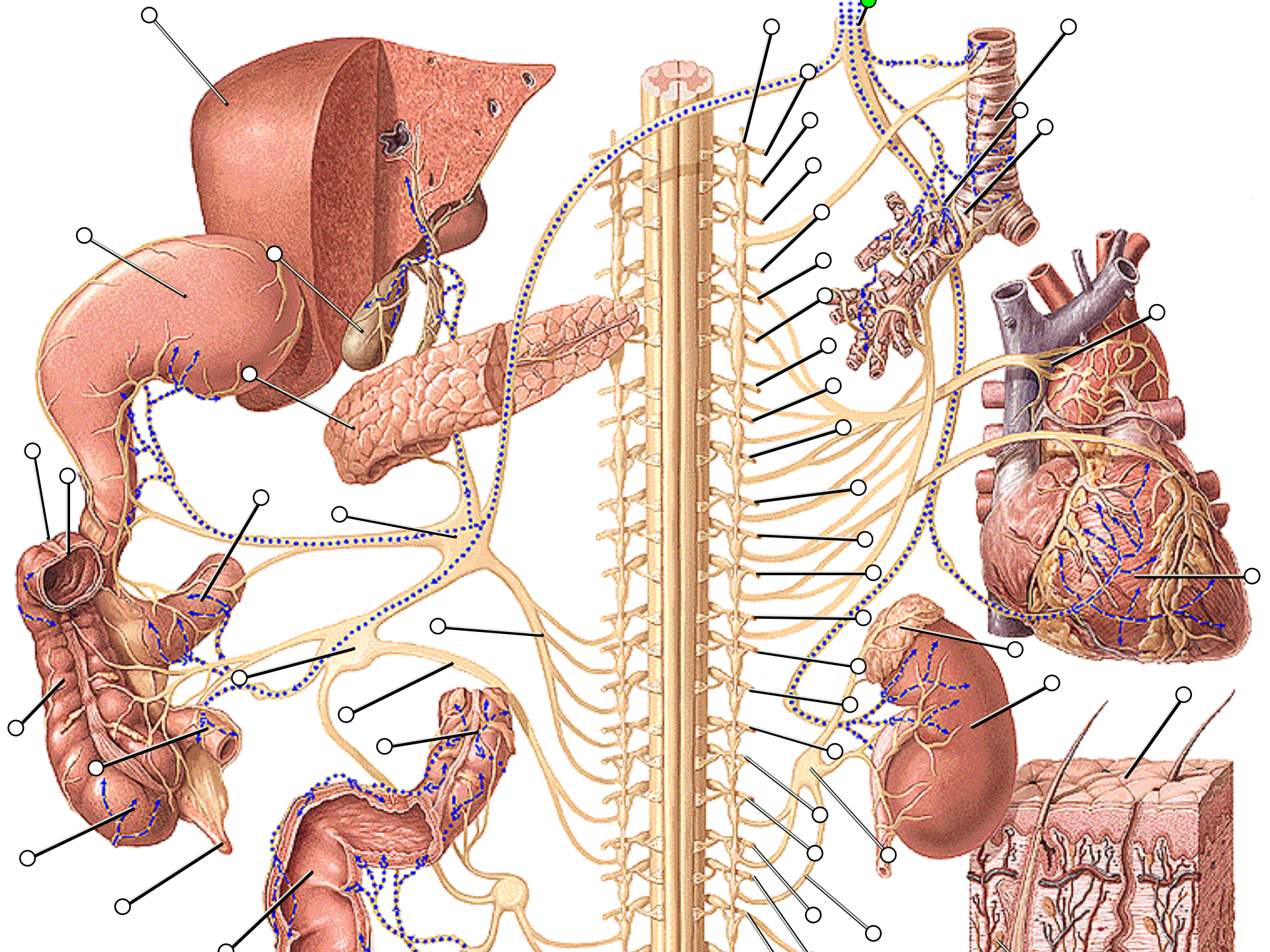
Vagus (CN X)

C: Mixed

O: Sensation from pharyngeal area and outer ear **/ motor from medulla**

D: Sensory to medulla **/ visceral (autonomic) motor to thoracic and abdominal cavities and their organs.** **Major motor pathway for ANS**

Most important Cranial Nerve!



Accessory (CN XI) AKA Spinal Accessory

C: Motor

O: Motor nuclei of medulla and spinal cord

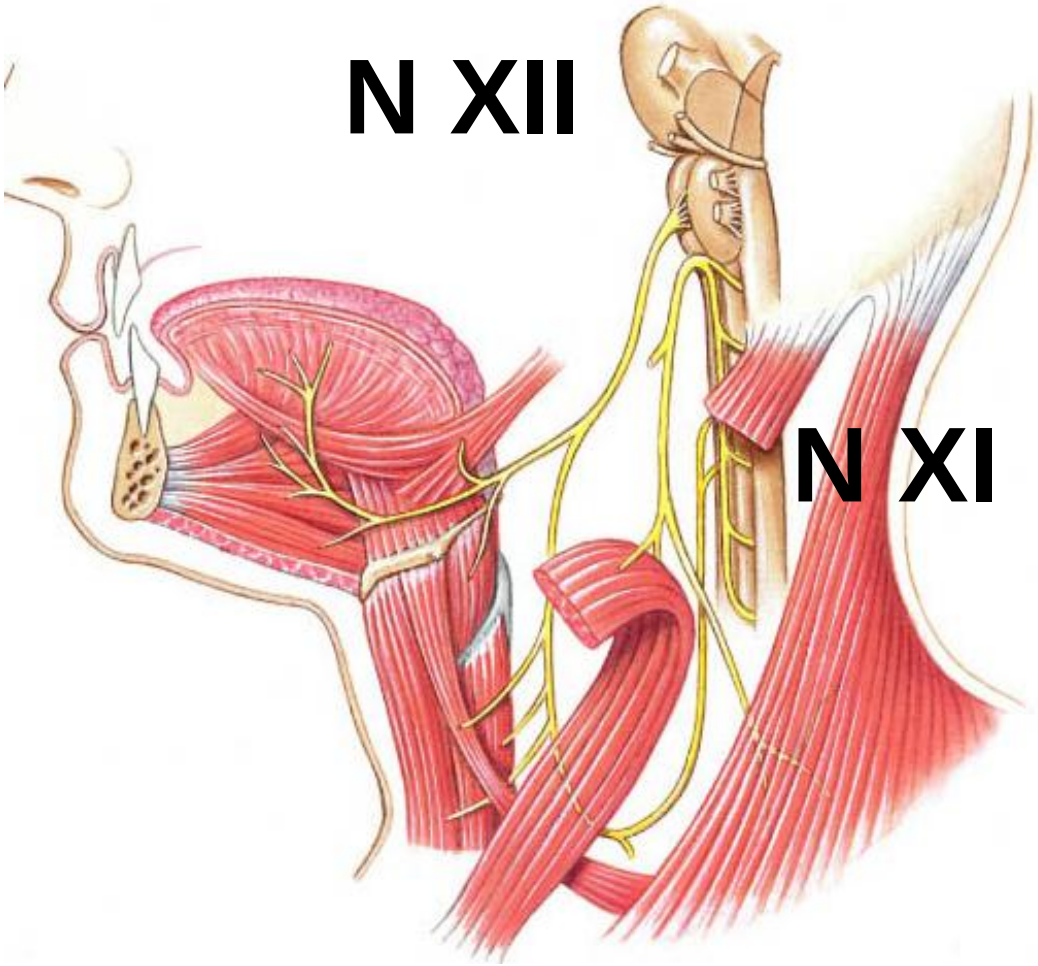
D: Swallowing, trapezius & scm muscles

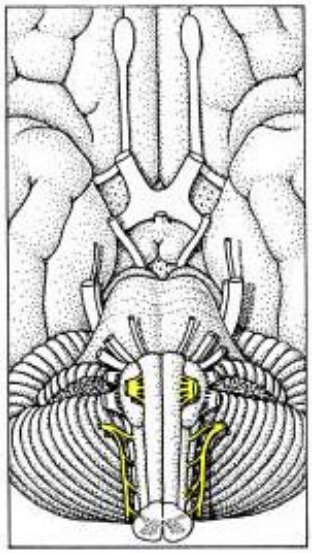
Hypoglossal (N XII)

C: Motor

O: Motor nuclei of medulla

D: Tongue musculature


N XII
N XI



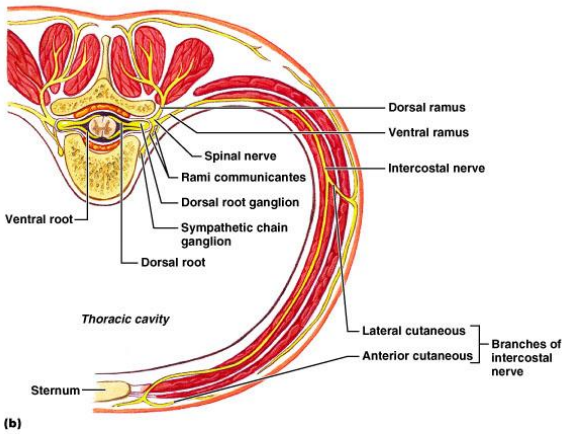
Mnemonics

Out On Our Table Top Are Fruits, Very Green Veggies And Hamburgers

Oh, Once One Takes The Anatomy Final, Very Good Vacations Appear Heavenly

Spinal Nerves

- Sensory and Motor (of course)
- Through the Intervertebral Foramina
- Dermatomes



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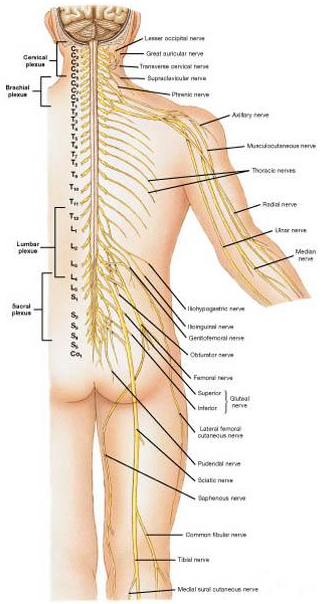
4 Principal Plexuses

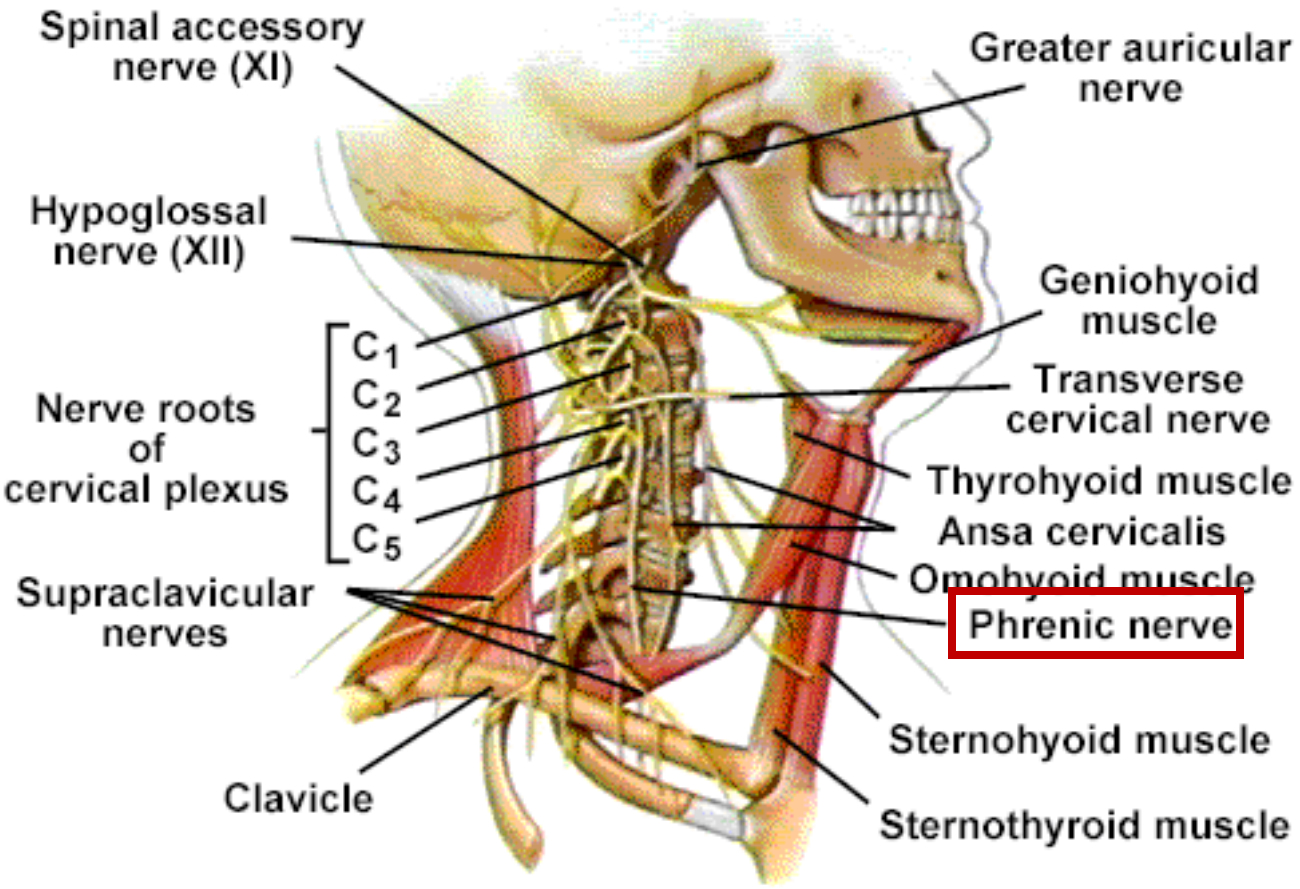
A blend, or network, of nerve fibers from several spinal roots.

1. Cervical, includes Phrenic N.
2. Brachial
3. Lumbar
4. Sacral

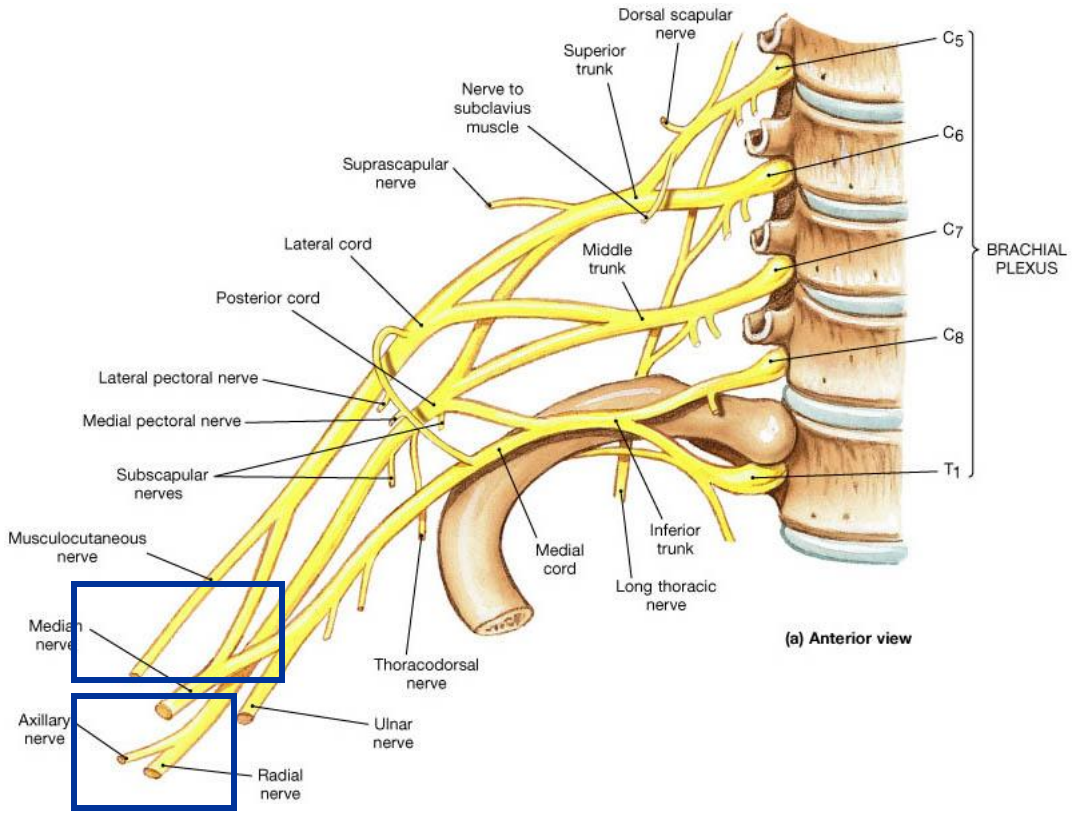


1. Cervical Plexus

Phrenic nerve
- innervates diaphragm

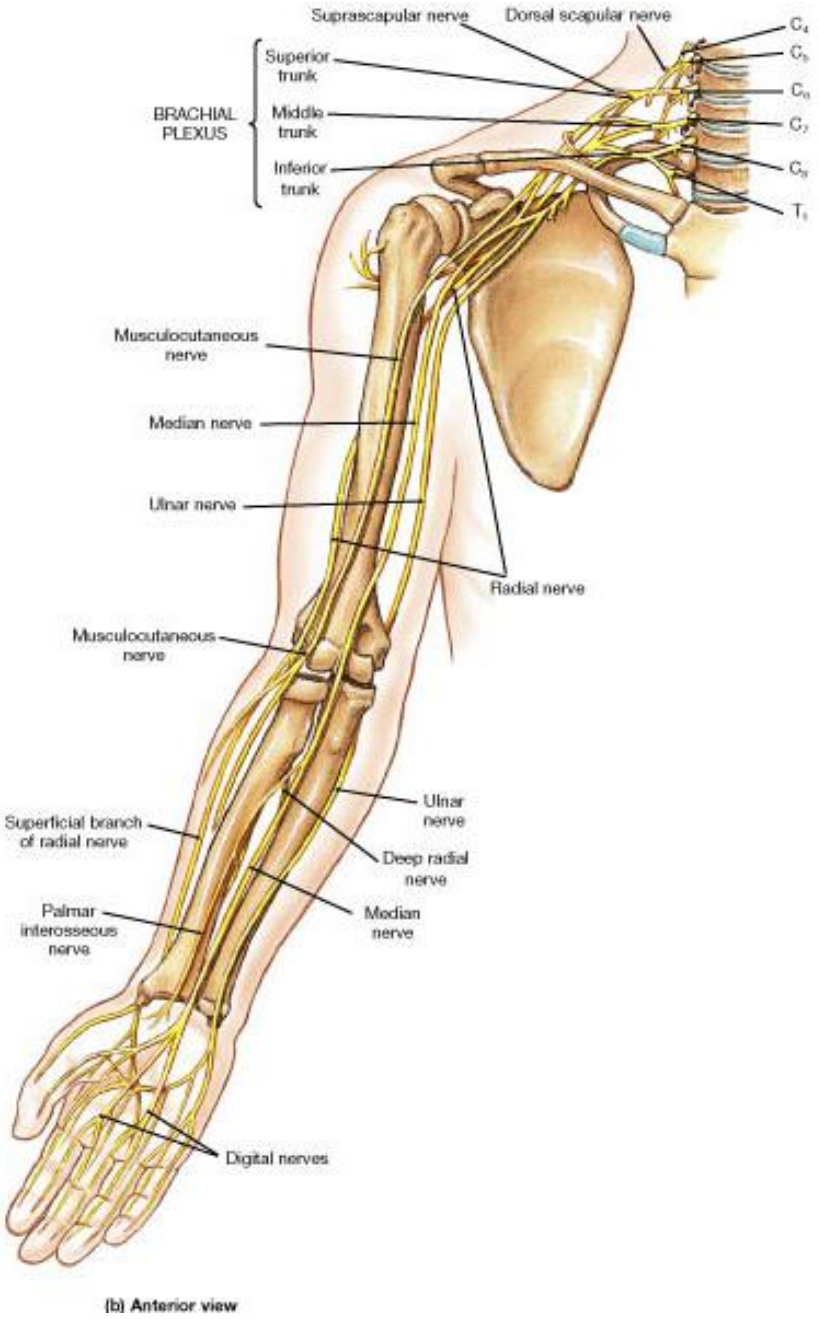


2. Brachial Plexus



Nerves of the Arm

Musculocutaneous nerve – innervates biceps and brachialis muscles
Median nerve - innervates lateral flexors
Ulnar nerve - innervates medial flexors
Radial nerve - innervates forearm extensors

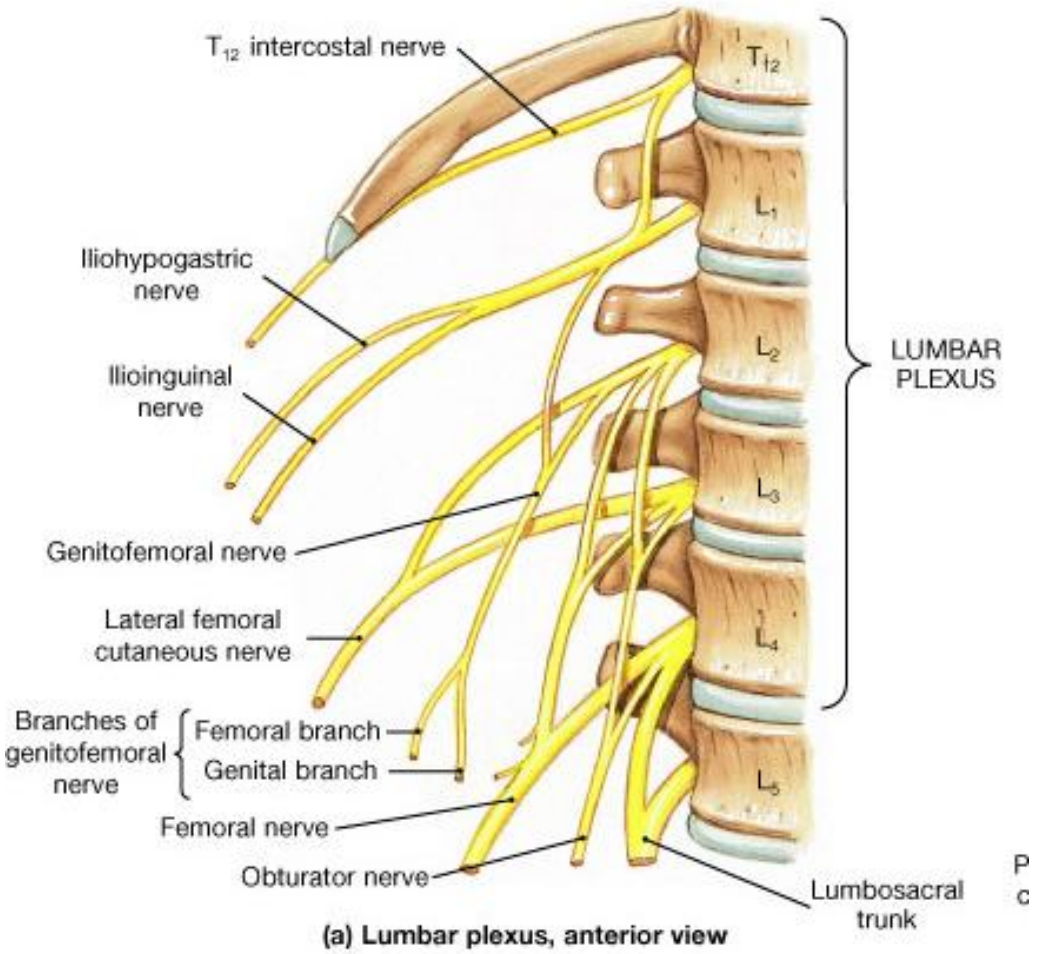


3. Lumbar Plexus

Femoral Nerve

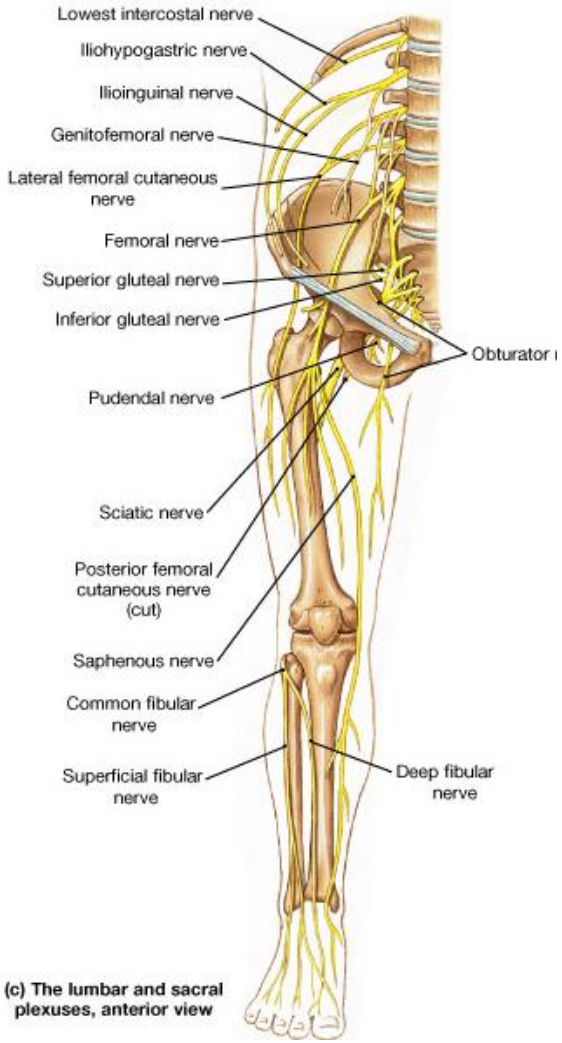
Lumbosacral Trunk (to Sciatic Nerve)

Obturator Nerve

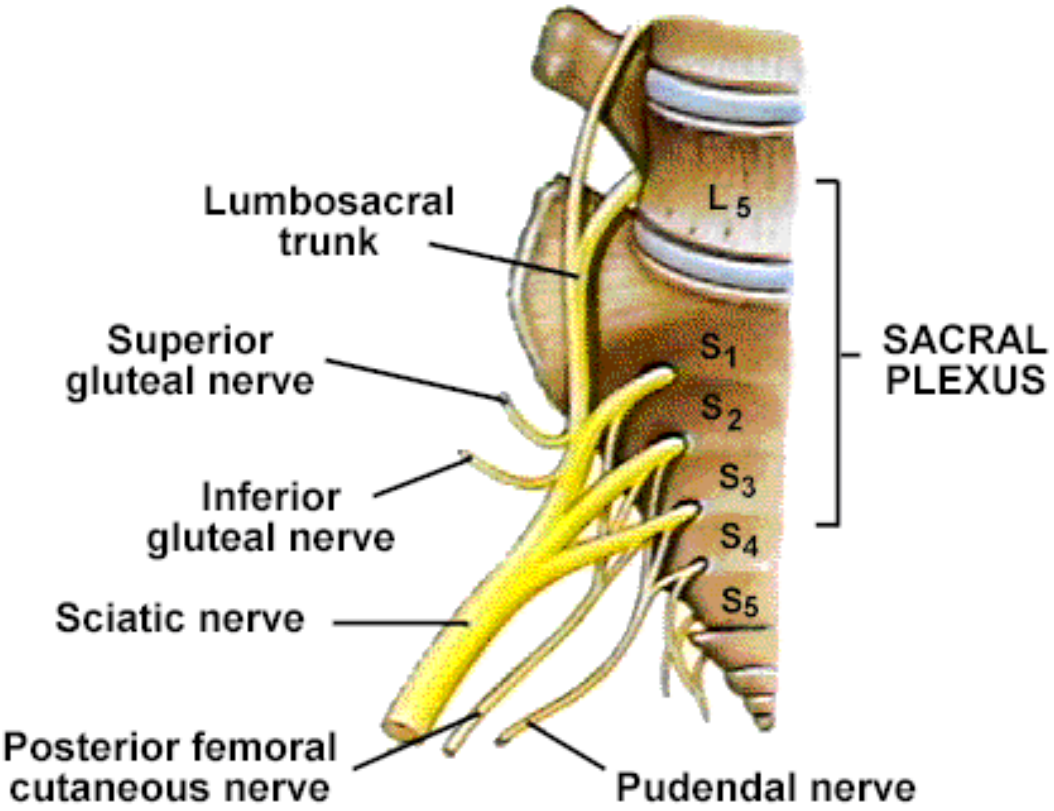


(a) Lumbar plexus, anterior view

4. Sacral Plexus

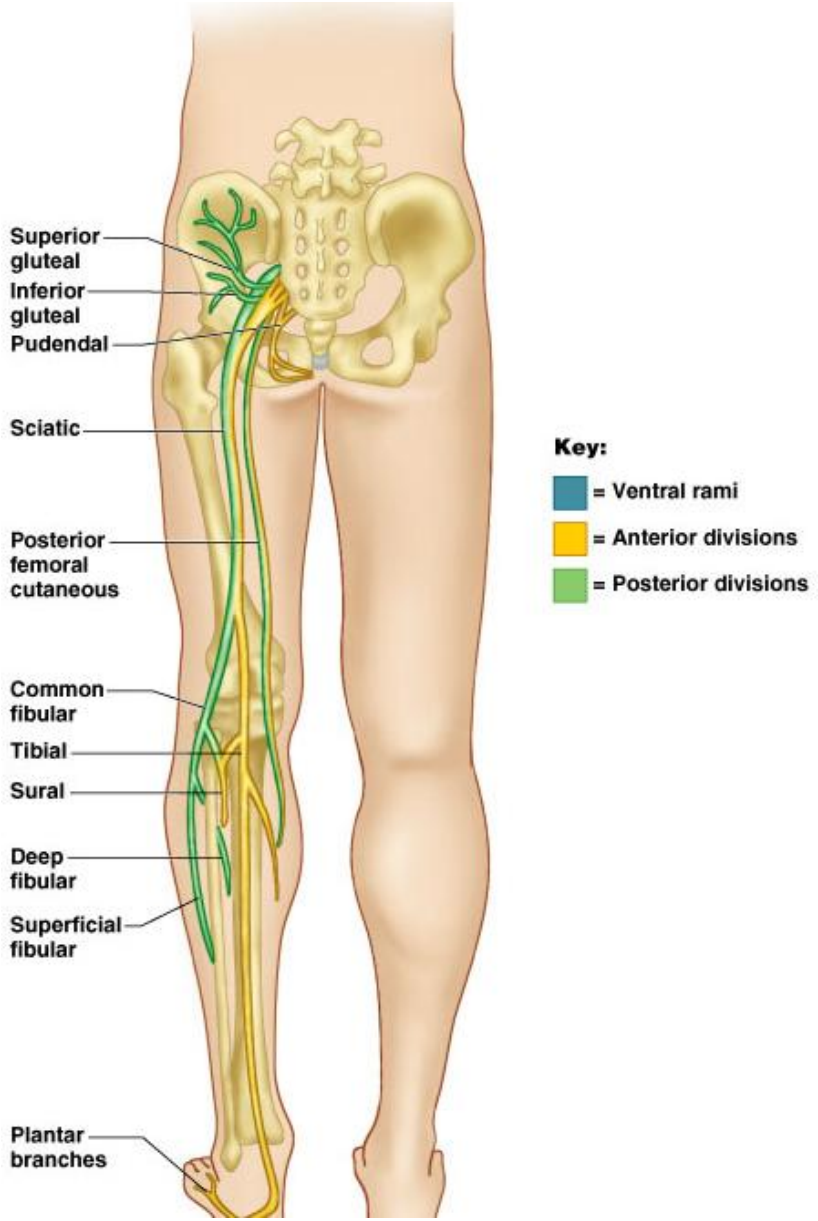


(c) The lumbar and sacral plexuses, anterior view

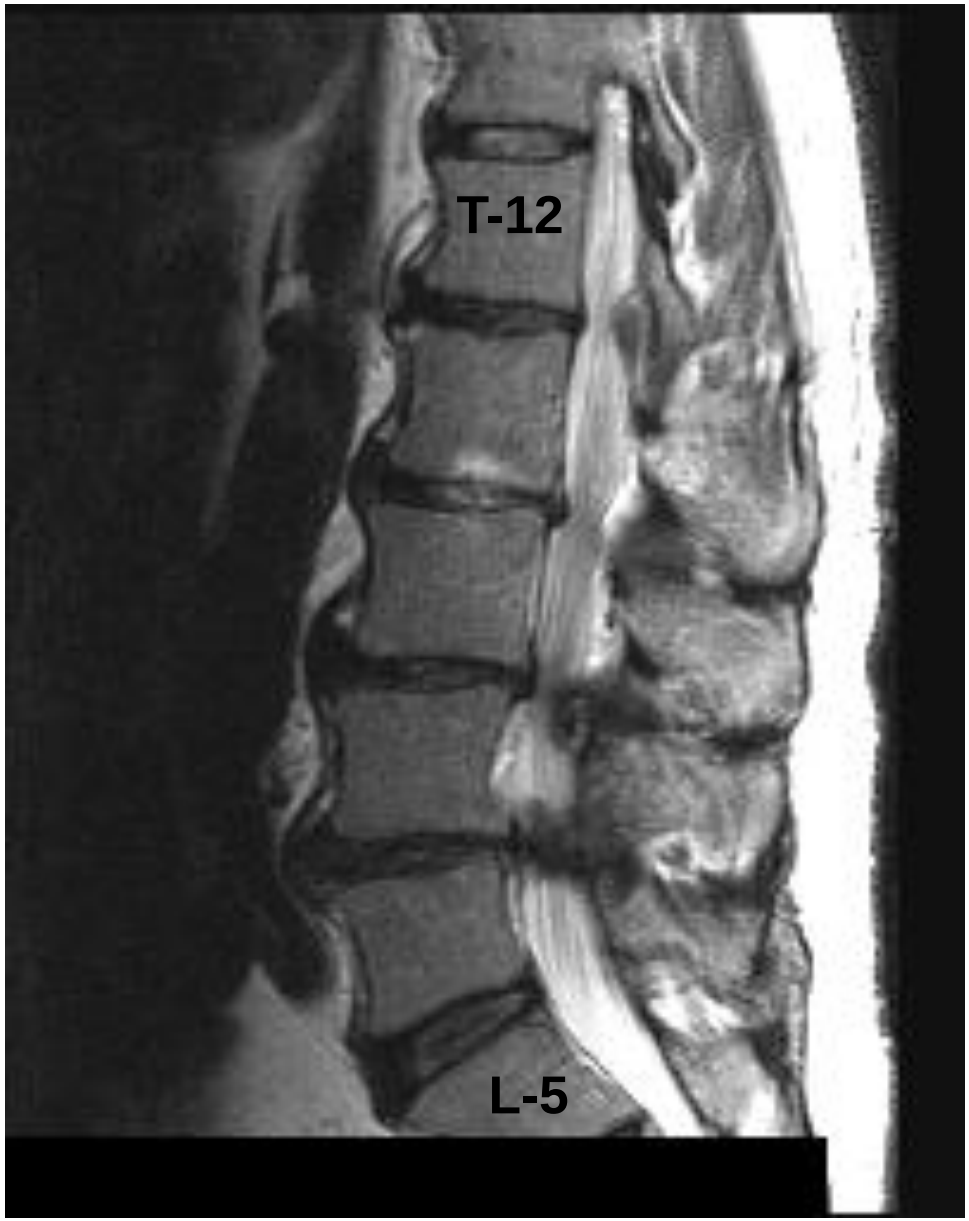


Nerves of the Leg

- **Sciatic N.**
  - **Thickest and Longest**
  - **Branches to Tibial and Fibular Nerves**
- **Femoral N.**
  - **Posterior aspect of leg**



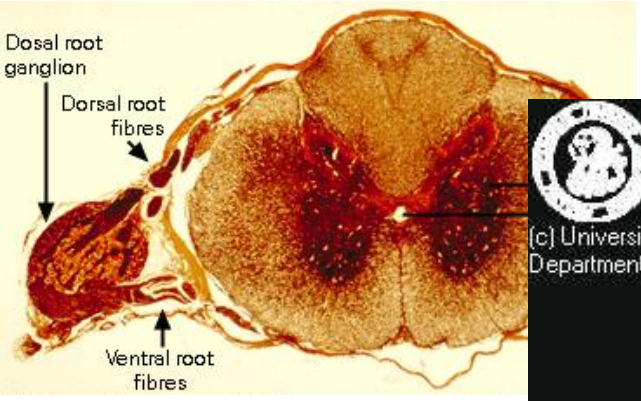
Narrow lumbar disk spaces result in pressure on the spinal roots



The white oval is a postsurgical cyst or abscess

Shingles

- *Varicella-zoster virus* **(of the herpes family)**
- **In dorsal root ganglia and cranial nerves**
- **Initial infection: chicken pox**



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